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A COMPARATIVE INVESTIGATION OF ATTENTION CONTROL TRAINING AND ATTENTION CONTROL TRAINING AUGMENTED BY EMG BIOFEEDBACK

by

(C) RONALD JOHN SNYDER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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James W. Barton

Murray Smith

Date July 7, 1982

Dedication

To my family for their love,
support, and patience.
To myself in pursuit of higher education
in a discipline I shall always support
and am proud to be affiliated with.

Abstract

The purpose of this study was to examine and compare the effectiveness of EMG biofeedback and Attention Control Training as instrumental techniques for muscle tension reduction and relaxation training.

Twenty-seven male subjects were administered Spielberger's State Anxiety Inventory and then randomly assigned to one of three treatment groups. The two experimental groups participated in three, twenty minute relaxation training sessions each week, for six weeks, while no treatment was given to the control group. EMG activity was monitored at the frontal region for all three groups.

A four-way ANOVAR with repeated measures indicated a significant treatment group by periods interaction at the $p<.006$ level. The analysis also indicated a significant main effect for the treatment groups at the $p<.025$ level, and for periods, $p<.001$.

The results provide evidence that learning to relax is best facilitated when an awareness of changes in EMG activity is provided while simultaneously refocusing mental activity.

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I would like to thank my graduate advisor, Dr. Richard B. Alderman, for his support and direction throughout the hardships of my master's program at the University of Alberta.

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I. INTRODUCTION

> Anxiety in sports activity is particularly widespread because of the fact that here, as nowhere else, a person, against a background of sizeable physical and neuro-psychic loads in training sessions and competitions, is constantly subjected to the action of the most variform interpersonal and micro-environmental influences (Hanin, 1978).

In athletics, given the assumption that all is equal for each athlete with regards to training equipment, practice and training periods, coaching expertise, and dietary restrictions, it would seem reasonable to postulate that at the end of an event or events, as in the pentathlon, the final results for each competitor would equate with each others. As we have witnessed from past performances, this is not the case. At the more elite levels, what seems accountable for the variability in performance outcomes is the athlete's ability to cope with the stressors and anxiety states experienced in the sporting milieu (Wenz and Strong, 1980).

It is apparent that because athletics has become so highly competitive in nature, certain individuals are likely to respond with high levels of anxiety (Tomayko, 1980). If not trained to cope with such a response, the athlete will experience changes in somatic functions such as increases in heart rate and respiration, blood pressure, muscle tension, and perhaps a shift in attention from the task at hand

(Zaichowsky, 1980). These aforementioned responses have a direct relationship to the psychological component of performance.

A current shift in the stress research has brought about a better understanding of the psychophysiological reactions associated with the 'stress-response' and as a direct result, innovative strategies for coping with stress and anxiety have evolved (Fenz, 1975). Lazarus (1975) has suggested that two major categories of coping processes are activated when a person is confronted with a threatening situation: *direct actions* and *palliative modes*. Direct actions are inherent responses which refer to behaviors associated with the 'fight or flight' concept, and palliative modes, though not directly responsible for altering the threatening situation, serve to relieve the emotional disturbances by means of thoughts and actions. This particular combative process can vary in approach: from the employment of defense mechanisms such as 'denial', to a redirection of attention, to the use of physically orientated methods (e.g. the use of drugs, biofeedback training, relaxation techniques) (Lazarus, 1975).

The importance of psychological factors in athletics is a concern that is receiving considerable attention. A growing interest from coaches, athletes, and sport associates has initiated an infiltration of stress/anxiety management techniques into the athletic environment: systematic desensitization (Wolpe, 1969);

visuomotor-behavior-rehearsal or VMBR (Suinn, 1972); cognitive-affective stress management training (Smith, 1977). Though these techniques differ in procedural construction, their objectives are similar; integrating the mental processes with physical functioning for the purpose of enhancing performance by managing subjective feelings of anxiety (Ziegler, 1978). Two additional techniques; biofeedback, an instrumental approach, and Attention Control Training, have also been practiced for coping with anxiety.

Biofeedback, a technique which allows selected physiologic activity to be monitored and voluntarily manipulated, has been demonstrated to be successful in reducing anxiety states when practiced independently or in combination with other relaxation techniques (Blair and Orlick, 1977; Brown, 1977). One of the more widely used modalities in biofeedback, for relaxation training, is electromyography (EMG) which provides visual and auditory information about muscle tension levels.

The interrelationship between cognitive processes and direction of attentional focus are the characteristics from which Nideffer (1978) developed the Attention Control Training (A.C.T.) relaxation training technique. By attending to non-threatening stimuli, Nideffer (1978,1981) proposes that a person is capable of inhibiting increasing levels of anxiety; thereby, allowing appropriate attentional focus to performance cues. Controlled breathing and attending to a specific body part is the basic concept of

this procedure.

This study is an attempt to investigate the effectiveness of Attention Control Training and Attention Control Training assisted by EMG biofeedback as methods for reducing muscle tension levels and learning to relax. Because stimuli subjectively perceived as threatening can interfere with performance, cognitive-coping strategies and relaxation techniques can be useful for managing anxiety levels. By means of instrumentation, muscle tension was monitored and EMG biofeedback was provided utilizing a microvolt meter and light feedback. Attention Control Training was presented by a pre-recorded cassette tape designed to refocus attention from distracting stimuli.

A. Importance of the Study

> In specific investigations of various conditions of stress, of emotional tension, the study of their physiological conditions predominates and very little attention is devoted to the actual psychological aspects. . . (Lomov, 1971).

Only within the past decade have experimental investigations surrounding the condition of anxiety provided researchers with a better understanding of the psychological reaction to stress factors (Hanin, 1978; Spielberger, 1979). The application of stress/anxiety management techniques to sport has received considerable interest from psychologists, coaches, and practitioners of physical education (Ziegler,

1978; Hanin, 1980; Oxedine, 1980). In a review by Bauer (1978), high levels of catecholamine have been discovered preceeding actual sport competition, and these adrenalin increases were interpreted as psychologically influenced, not only in the acute stress situation, but during the anticipatory phase as well. It is during this phase that anxiety management techniques can become useful to those who are negatively affected by stressful situations.

One such technique, Attention Control Training or A.C.T. (Nideffer, 1978), attempts to train people to command their anxiety state by refocusing attention from distracting, threatening stimuli to appropriate situational cues. No reports of empirical research have been published utilizing Nideffer's technique other than by Nideffer himself in his book 'Attention Control Training' where anecdotal information of case studies has been cited.

The investigator became interested in examining the effectiveness of the aforementioned procedure for several reasons: (1) Because empirical research is non-existent to support Nideffer's claim, a closer examination of the effectiveness of A.C.T. is needed before one begins to apply it to psychotheraputic purposes; (2) The nature of the A.C.T. procedure requires an attentive focus on a spot directly behind the navel, a practice not common with most people. Though a successful practice by the masters of martial arts, one can ask whether or not this refocusing of attention is possible for the ordinary person? (3) And of

last major concern, does a greater learning effect occur when information is provided of physiological states during the practice of A.C.T.?

The following study was conducted in appreciation for further information regarding these concerns.

B. Statement of the Problem

To examine and compare the effectiveness of Attention Control Training practiced independently to being practiced with visually assisted EMG biofeedback as facilitative approaches for muscle tension reduction and relaxation training.

Hypotheses

Four directional hypotheses were presented and tested in this study:

1. Subjects receiving treatment in the form of both EMG biofeedback and Attention Control Training will exhibit a significant decrease in EMG activity in comparison to those subjects practicing only Attention Control Training or no relaxation training at all.
2. Subjects receiving Attention Control Training will exhibit a significant decrease in EMG activity in comparison to those subjects receiving no Attention Control Training.
3. Subjects receiving EMG feedback will exhibit a significant decrease in EMG activity in comparison to

those subjects receiving no EMG feedback.

4. High state-anxiety subjects will exhibit a greater decrease in EMG activity as a function of training in comparison to low state-anxiety subjects.

C. Definition of Terms

ANXIETY - A psychophysiological response to a situation perceived as either threatening or of real potential danger to that person (Spielberger, 1966).

BIOFEEDBACK - A technique which permits a person to audiovisually observe physiological activity of bodily functions (Brown, 1977).

ELECTROMYOGRAPHY - A procedure which permits the monitoring of electrical activity in muscles.

MUSCLE TENSION - A state of increased neuromuscular activity which is excessive to normal daily functioning (Barton, 1981).

RELAXATION - A state of reduced physiological and psychological arousal (Wilson and Bird, 1980).

STATE ANXIETY - An emotional state at a particular moment which varies in intensity and fluctuates from one situation to another (Spielberger, 1966).

STRESS - A demand placed upon the body which causes readjustment or adaptation to normal functioning order (Selye, 1974).

STRESS RESPONSE - A stimulus reaction that activates psychological and physiological mechanisms (Everly and

Rosenfield, 1981).

SURFACE ELECTRODES - Circular disks adhered to the skin surface for transference and measurement of electrical potentials in muscle tissue.

II. REVIEW OF LITERATURE

A. Stress and Anxiety

The terms stress and anxiety have been used interchangeably to describe the emotional product of a situation or event. This has led to further confusion of their appropriate meanings (Appley and Trumbull, 1977). In Spielberger's (1979) attempt to explain the concepts of stress and anxiety, distinctions between the characteristics of stressors, threat, and anxiety states were required, thus providing the following temporal sequential diagram:

STRESSOR ⟶ PERCEPTION OF THREAT ⟶ ANXIETY STATE

The term *stressor* refers to situations or stimuli comprising of potentially harmful or dangerous qualities to a person's physical or psychological well-being. The term *threat* is the perception or appraisal of the situation or stimulus as being harmful or dangerous and *anxiety state* describes the emotional reaction to the preceeding events which is accompanied by physiological and psychological reactions such as increases in muscle tension, rapid heart fibrillation, and inability to concentrate.

Simply, stress creates a disturbance to the homeostasis of the internal environment, which in effect, causes a bodily reaction for adaptation or readjustment to normalacy (Cannon, 1929, 1977; Selye, 1974). An influential pioneer on

research and thought in this field, Hans Selye (1977) indicates that although the situation or stimuli is of importance, it is the intensity of a demand placed upon the adaptive capacity of the body that researchers should be most concerned about. In his attempts to explain why different stressors produced similar physiological responses, Selye developed the General Adaptation Syndrome (G.A.S.) or the Biological Stress Syndrome. The triphasic nature of G.A.S. provides practical relevance to the understanding of the body's adaptability. There is an initial reaction phase when the body is first exposed to a stressor followed by a resistance phase where the body adapts and begins to resist. The duration of a resistance phase is dependent upon the intensity of the stressor and the body's ability for adaptation. Eventually, exhaustion proceeds from exposure to the stressor resulting in a depletion of adaptation energy, and finally death.

The analysis of psychological stress is distinguished from existing types of stress analysis by the condition of threat (Lazarus and Opton, 1966). A leading authority on stress from a psychological perspective, Richard Lazarus (1966) views the stress process as primarily an interaction between the human organism and environment. This interaction causes a multitude of varying responses for different people and is exclusively subject to the appraisal of the situation. Appraisal is a continuous process and if threat of endangering significance exists, coping processes,

psychological in nature, intervene between the stress stimulus and stress response for the purpose of eliminating the threat (Lazarus, 1966). Lazarus presents the following discussion on adaptive behavior:

> . . . the psychology of coping is largely descriptive in nature, rather than systematic and predictive. People use a wide variety of coping processes, depending on their personal characteristics, the nature of the environmental demands and contingencies, and how they are appraised. They engage in a variety of preparatory activities. For example, they may worry without taking adequate steps to increase their effectiveness in confrontation; they reduce intense arousal by periodic disengagements from stressful transactions; they take tranquilizers to lower excessive levels of arousal; they use antispasmodics to quiet their bowels; they practice positive mental attitudes; they try to tell themselves that the problem will work itself out or that there is really no problem; they seek support from loved ones or those they trust; they try this or that stress prevention fad or fashion, such as transcendental meditation, psychotherapy, relaxation, hypnosis, yoga, etc.; they direct their attention away from the source of the threat and toward benign or escapist literature or movies; they cope with less ultimately by giving up what was previously a central portion of their psychological domain (1977, 153-154).

Further studies in the ways environmental factors determine and influence behavior (Zborowski, 1969; Cannon, 1972; Glass and Singer, 1972) have explored the roles of cultural environments to explain the production of threat appraisals. Interestingly, Cannon (1972) approaches the condition of "voodoo death" and the physiological processes associated with high levels of stress. Initiated by

individual belief that punishment will ensue for transgressing from a cultural norm, the "terror-experience" causes a prolonged overexcitation of the medullary sector of the adrenal glands. This belief is further reinforced by social isolation and ritual proceedings. The end result is similar to that of the G.A.S. model presented earlier.

Researchers in this area of sport activity have found that increases of psychological stress are analagous to higher stressful situations (Fenz and Epstein, 1969; Martens and Gill, 1979), whereby changes in somatic processes occur. Though physiological stress ". . . usually produces highly stereotyped responses through innate neural and hormonal mechanisms", psychological stress (i.e., subjective feelings of tension, apprehension, nervousness and worry, and heightened activity of the autonomic nervous system) ". . . is not invariably followed by a predictable response" (Levi, 1967). What remains to be considered are the sources of differences in individual personalities to explain the dissimilar responses of people to identical stimuli and circumstances. The behavioral construct of anxiety will be discussed to assist in the explanation.

It is evident the behavioral phenomena of anxiety has been extensively examined, but that some ambiguity exists in the attempts to define its premise. Anxiety, an emotion of human personality and a broad, physically non-existent abstraction in science, possesses observable qualities and is admissive to individual interpretation (Levitt, 1967). As

Hanin views it:

> The condition of anxiety is the first emotional reaction to the most varied stress factors and therefore appears as an inalienable part of the emotional experience of the participants of whatever significant activity, particularly under natural conditions (1978: 236).

Because anxiety possesses a unique role in the adjustive process of the human organism, it acts as an indicator of response to stress as well as a precursor of further stress responses (Grinker, 1966).

The unpleasant emotions experienced during an anxiety state or condition can affect both physiological (i.e., skin conductance, muscle tension) and cognitive processes (i.e., loss of concentration)(Tomayko,1980). In sport related activities, anxiety levels of varying magnitudes have been observed to enhance or negatively affect performance outcomes (Martens and Landers, 1970; Nideffer, 1978). Ziegler brings to our attention that "the success or failure of an individual athlete is dependent on the blending of physical ability, conditioning, training, mental preparation, and the ability to perform well under pressure" (1978: 257). Why then do people in identical situations respond differently? It is apparent that these reactions cannot be exclusively defined to the situation alone and that an individual's emotional type is of major consideration.

Spielberger (1966) in his attempt to explain anxiety presents this construct as characterized by two dispositions: (1) State Anxiety (A-State) which is a momentary reaction that varies in intensity to situations perceived by a person to be threatening, and (2) Trait Anxiety (A-Trait) expressed as a fairly stable characteristic in which the person often experiences certain levels of A-State and allows for prediction of emotional reaction to similar situations. The intensity of anxiety as an emotional state has been found to effect performance patterns (Cannon, 1965; Weinberg and Hunt, 1976; Scanlan, 1978). Spielberger (1979) points out that individuals high in A-Trait are likely to perceive situations as more threatening in comparison to low A-Trait individuals; and they are more likely to respond to perceptions of threat with more frequent increases in A-States. Thus, many high A-Trait people are vulnerable to stress because they tend to view many situations as threatening. As a result of Spielberger's research, the State-Trait Anxiety Inventory (STAI) was developed to measure a persons general anxiety level across situations as well as transitory reactions to specific situations.

Theoretical beliefs of anxiety are based on the degree to which the emotion is specific to the stimulus, or its appropriateness to a situation (Levitt, 1980). The trait approach contends that people who inherit relatively stable personality traits will respond with more or less similar

behavioral responses to all types of threatening situations (Cattell, 1966; Martens, 1971). The perceptions of situational conditions have been proposed as the prime determinants of behavior (Lazarus, 1966; Mishel, 1973; Meichenbaum, 1977). Endler (1973) believes that the interaction between person-type and the situation evokes associated actions.

B. Biofeedback and Electromyography

There generally exists two types of anxiety; *non-specific* or *free floating* in which apprehension, not attached to any type of stimulus, generates a feeling of anxiousness; or a more *specific* kind of anxiety where behavior is directly associated to a certain undertaking or anticipation of events (Karlins and Andrews, 1972). Increases of muscle tension, heart rate, and nervousness have been recognized as responses to anxiety (Budzynski and Stoyva, 1969). Lippold (1952) observed that a linear relationship exists between muscle tension, a reaction to anxiety, and the electrical potential this tension provides. One method of reducing these anxious states is learning to relax. Biofeedback training has proven to be successful in creating a relaxation response (Grim, 1971).

The biofeedback approach "opens a window" to the internal functions of the human organism. A person becomes an active participant in understanding what is wrong and in the process is capable of controlling or changing the

disorder (Schneider and Culver, 1979). Although Jacobson's Progressive Relaxation (Jacobson, 1938) has been widely used in relaxation training, the training is lengthy, and success is dependent upon subjective evaluations by the trainee (Budzynski, 1977).

> Discriminations of this sort seem to be particularly difficult for those individuals who most need training, that is, those who suffer from stress-related disorders. Because their levels of arousal are frequently high, those individuals tend to become adapted to, and therefore lacking in awareness of, these sensations. Consequently, training effectiveness could be improved by the addition of a technique that would aid in the development of these fine discriminations (Budzynski, 1977: 436).

A proponent of biofeedback as a technique to combat stress-linked dysfunctions and anxiety, Budzynski further states:

> Biofeedback enhances discrimination of subtle physiological functioning because it produces an "effect" where before there was little or no effect signalling change in such functioning (1977: 436).

Barbara Brown (1977), a foremost authority on biofeedback, proposes that the success of biofeedback learning is dependent upon the kinds of quality and accurate information provided. In her book, 'Stress and the Art of Biofeedback', Brown (1977: 12-13) lists the *kinds* of information she sees as important:

1. *Biological information*, which is the biofeedback signal.
2. *Cognitively useful information*, which is background information, i.e., the nature of the physiological activity , how it behaves, how it is measured, what the instrument does, and other relevant information.
3. *Strategy information*, i.e., clues or strategies for controlling physiologic activity "by mental means".
4. *Psychologically supporting information*, which is encouragement and reinforcement or performance that acts to consolidate the learning experience.
5. *Experiential information*, which is the internally derived information from memories and from associations of newly perceived information from the biofeedback signal with internally perceived changes in the mind and body states.

A variety of biofeedback modalities are available for relaxation training: electromyography (EMG), electroencephalography (EEG), galvanic skin response (GSR), thermometers to measure temperature, and blood pressure instruments (Jencks, 1977). Brown views EMG biofeedback as ". . . probably the most useful of all the biofeedback techniques, . . . also one of the easiest for the patient to learn" (1977: 52).

Budzynski and Stoyva (1969) have conducted extensive research concerning anxiety and muscle relaxation while

monitoring the frontal region*. This site is chosen because it acts as a 'barometer' of the body's general relaxation level (Budzynski and Stoyva, 1969; Leaf and Gaarder, 1971). The employment of EMG for relaxation training has proven successful in reducing muscle tension levels (Budzynski and Stoyva, 1969; Leaf and Gaarder, 1971; Haynes, Mosley, and McGowan, 1975). A study by Coursey (1975) found that subjects who utilized EMG feedback for training were significantly more effective in lowering muscle tensions in comparison to groups given simple verbal instructions to relax or given instructions about relaxation but no biofeedback. Though these aforementioned investigations advocate the practicality of EMG, biofeedback training was found not to be superior to less expensive, less instrument-oriented treatments as relaxation and coping skills training (Fichtler and Zimmerman, 1973; Epstein, Weber, and Abel, 1976; Siddle and Wood, 1978). Their main concern was cost-oriented and the usefulness of biofeedback in comparison to less expensive approaches that are designed to regulate stress.

Lawrence and Johnson (1977) directed a research program concerned with self-regulation as an aid to enhance human performance. They concluded from their review that no

---

*Basmajian (1982) clearly indicated that the term *frontal region or area*, from the Latin origin meaning *forehead*, should be used when one refers to the frontalis muscle as a monitoring site of EMG activity. The biologically fedback information is not specific to the frontalis muscle alone, but generalized electrical activity from the scalp, neck, and facial movements (i.e., eye blinking and nose twitches).

substantial evidence is available to support the proposition that biofeedback training significantly enhances performance, though it has been found to be a successful technique in learning how to relax and in maintaining desired arousal levels.

C. Attention Control Training

An explorer of the psychology of attention, Robert Nideffer (1978) proposes that a relationship exists between attention and performance. In his efforts to define the importance of mental factors in physical activity, Nideffer presents the following discussion:

> The idea that attention, the ability to direct our senses and thought process to particular objects, thoughts, or feelings, is important in being able to perform effectively is not new. Unfortunately, we have not clearly defined what we mean by attention, or what attentional demands for a particular situation are. Very often we infer the individual was attending properly if they were successful and improperly when they were not. This lack of definition does little to assist either the athlete or the coach in understanding what went wrong. Shouts such as "keep alert," "use your head," "pay attention," and "open your eyes" offer little in the way of concrete corrective information. To be able to teach and communicate effectively, the coach must be able to define the attentional demands of a particular situation, to be able to point out the specific "mental errors." To perform effectively, the athlete must be capable of responding to these attentional demands (1978: 231).

Silverman (1970) describes attention as either *intensive*, *extensive* or *selective*. The intensive aspect of

attention refers to the responses or levels of arousal that are activated when an individual is exposed to the properties of the stimuli. Berlyne (1960) reported behavior as generally controlled by stimuli of greater arousal intensities. Extensiveness of attention refers to the degree to which stimuli in the environment are attended to, while selective attention refers to a process to which certain environmental stimuli are selectively chosen and given precedence over others (Kahneman, 1973). This is demonstrated by the "Cocktail Party Phenomenon" where a conversation of one person is easily extracted from the presence of competing messages. Keele (1973) suggests that this could possibly be explained by the physical locations of the voices and the frequency characteristics of the different voices.

Broadbent developed the "Filter Theory" in an attempt to account for a person's ability to attend selectively to messages while at the same time disregarding others. He suggests that certain messages, due to physical features (i.e., location and frequency), are filtered and inhibited from contacting memory. These ignored, filtered messages are not remembered because they are denied the opportunity to elicit any meaning. Contradictory to Broadbent's theory, Triesman (1964) feels that all messages are attenuated and only those which are of importance to the person are detected, thereby generating further attention processes to continue. An example of this attenuation theory is

illustrated when people, while in a conversation, take notice of their spoken name in another conversation, and this occurs when their name is spoken from another location or different frequency from where they are attending to (Moray, 1959).

As proposed by Keele (1973: 141) regarding conscious perception, ". . . what people usually perceive or are consciously aware of is not sensory information but that which has been activated in memory or currently being operated on". Whorf (1940) contended that we view our environment by what we see and the activation of stored information of stimuli in memory. Though people perceive the same stimulus, it is interpreted differently because the stimulus activates different contents in their memories (Keele, 1973). The extent to which information is attended to at any one moment is limited (Mowbray, 1959; Keele, 1973). To clearly perceive two different events happening at the same moment, both must be combined or interrelated in some way: if no relationship exists, one must be overlooked. Therefore, if attention is directed to one task, it is likely that irrelevant events or messages will be ignored (Vernon, 1966). Nideffer (1976, 1978) views the dimensions of attentional processes as important factors in understanding attention. The attentional demands of a particular situation may require adjustments in width and/or direction of attentional focus to effectively cope with the task at hand. The attentional dimensions of width refers to

the amount of information that is attended to and processed at any given time; this is further subdivided into narrow focus and broad focus. The dimension of direction refers to 'locus of control' and is thought of as being internal or external. Depending on the demand(s) placed upon the person, these dimensions will fluctuate accordingly on a continuum. Thus, four types of attentional dimensions are possible resulting from environmental interaction: (1) broad-internal focus, (2) broad-external focus, (3) narrow-internal focus, (4) narrow-external focus. As stated by Nideffer (1978a: 232):

> Just as individual attention is defined in terms of width and direction of focus, the environmental situation will demand a certain type of attention. If the individual's attention corresponds to the environmental demands, they will function effectively; if not, they will make mistakes.

Initiated at the University of Rochester, Nideffer (1976) developed the Test of Attentional and Interpersonal Style (TAIS) to measure attentional and interpersonal processes as a means for predicting performance across a variety of situations. Six of the seventeen subscales in this test provide an indication of an individual's ability to control width and direction of attentional focus. Nideffer (1977) concludes that methodological problems of other studies attempting to examine construct validity have resulted in low correlations between the TAIS and other

behavioral measures of attentional processes.

As a student of the martial arts studying aikido and karate, Nideffer became interested in 'mind/body' integration and later developed a centering technique entitled 'Attention Control Training' (A.C.T.). This technique attempts to integrate mental and physical functioning for the result of controlling the effects of pressure on performance and on physical and emotional health (Nideffer, 1978).

According to Keele (1973), attention narrows as increasing environmental stimuli are perceived. Because a person can only attend to a particular stimulus or message clearly and effectively at a give time, an overload effect on attentional processes is possible if several stimulus cues are absorbed simultaneously (Silverman, 1970). Anxiety levels have been reported to be analogous to demands placed upon an individual whether it be internal/external or cognitive/environmental respectively (Weinberg and Hunt, 1976; Nideffer, 1978).

Nideffer (1978, 1981) presents several anecdotal cases where A.C.T. was employed and as a result, successful treatments were reported with overall improvements in performances. To control attention is to enhance performance (Nideffer, 1981), and as well, Nideffer views attention control as ". . . nothing more than being able to voluntarily direct your attention; to concentrate in ways that are consistent with the demands placed upon you by your

home, family, and job" (1978: 23).

It is evident that in the review of related literature reported in this chapter, theoretical positions of stress and anxiety vary in approach to explain these constructs. Biofeedback and electromyography were found to be useful techniques for controlling anxiety states and muscle tension levels. Attention Control Training, a more recent relaxation technique, is reported to benefit performance outcomes. An outline of the methods and procedures used in this study is presented in the following chapter.

III. METHODS AND PROCEDURES

Subjects were administered Spielberger's State Anxiety Inventory on two separate occasions and a mean State Anxiety score was computed for each person. The means were then grouped and based on anxiety level of either high or low, each subject was randomly assigned to one of three treatment groups: Attention Control Training (A.C.T.), EMG biofeedback and A.C.T., or Control. Prior to and following the six weeks of relaxation training for the experimental groups, EMG activity levels were examined via electromyography (EMG) of the subjects frontal region. The pre- and post-test scores of muscle tension were compared to determine if any significant changes occurred.

The Sample

The study sample comprised of twenty-seven males, ages 18 to 29 years. All subjects were full-time students attending the University of Alberta and volunteered to participate in the study.

Individuals having any experience with relaxation training were excluded from the study.

Electromyography (EMG)

The Autogen 1700 Feedback Myograph, by Autogenic Systems Inc., was used to monitor all EMG activity. This

unit provides analogous feedback in the form of auditory patterns and visual displays. A selection of nine auditory feedback modes are available (one for external audio feedback) and a meter display of EMG activity can be set for instantaneous or time-averaged data for visual feedback training purposes. Two sets of lights are featured which can be used independently or to supplement the audio and/or visual training process.

The Autogen system is designed to measure electrical potential to the millionths of a volt (uV) and is equipped with a bandpass filter to protect against possible electrical interference from the environment. The bandpass frequency was set at 100-200Hz which allowed for highly reliable artifact rejection and for monitoring EMG activity at very low microvolt levels. To avoid rapid fluctuations of feedback signals, the response time span was averaged every five seconds.

Three silver/silver chloride electrodes (Strong, 1979) were attached to the frontal region to monitor electrical activity. Each electrode was attached to the skin surface by an adhesive disk. To facilitate a good electrode contact surface, the skin was cleaned with a cotton ball moistened with rubbing alcohol prior to application of the electrodes. Electrode contact medium was placed in the electrode cups creating a bridge between the skin surface and electrode . which allowed the transmission of bioelectrical potential. Two positive electrodes were placed one inch above the

eyebrows at a midpoint perpendicular to each eye and the third electrode, which served as a ground, was placed one-half inch below and mid-way between the two positive electrodes. This is referred to as the 'horizontal placement' of electrodes and has been found to be a reliable measurement procedure (Williams et al, 1980).

State Anxiety Scale

A component of the State-Trait Anxiety Inventory (STAI), the State-Anxiety self-report scale (A-State) (Appendix B) is designed to measure emotional states that can differ in intensity and fluctuate from one situation to another (Spielberger, 1966). Requiring only six to eight minutes to complete the pencil and paper questionnaire, subjects are asked to report how they feel "at this particular moment" to twenty statements describing immediate thoughts and feelings based on a four point response scale.

In comparing the STAI with other psychological instruments designed to measure levels of anxiety, Levitt views the current State-Trait Anxiety Inventory as ". . . probably the most carefully developed and rigourously examined instrument that has yet appeared" (1980: 55).

As a measurement of the anxiety phenomena, the STAI has been found reliable with high school students (Hall, 1969), college students (McAdoo, 1969; O'Neil, Spielberger, and Hansen, 1969) and psychiatric patients (Parrino, 1969).

A. Experimental Design and Procedures

The experiment was designed in a randomized block form (Appendix A) to examine four factors: treatment groups (Attention Control Training, EMG biofeedback and A.C.T., and Control), anxiety level (high and low), period (weeks), and trials (four per session). Dependent variables of the experiment were EMG activity scores.

Recruiting Subjects

Instuctors of eight courses offered by the Department of Physical Education at the University of Alberta permitted the experimenter to enter their respective class to give an introduction, and answer any questions, regarding the study. A sign-up sheet was limited to the participation of males only and required an equal representation of both high and low anxious scoring persons. Therefore, the number of people initially recruited was greater than the final subject sample used in the study.

Screening of Subjects

An enquiry regarding age, faculty of enrollment, time schedule, and past experience with relaxation procedures was conducted for each person by a telephone interview. The main objective of this interview was to determine previous exposure to relaxation training techniques. If such an exposure was indicated (i.e., extension or seminar course offered by the University), the person was then excluded

from the study; otherwise, an appointment was arranged for the administration of the State-Anxiety Inventory.

A final screening of subjects for the study was conducted when all the state-anxiety scores were determined. The scores which closely approximated the group mean were excluded until an equal number of scores closest to either extreme were established.

Experimental Procedures

Spielberger's et al (1970) State Anxiety Inventory was administered twice, with a full day separating the first and second administration, to determine a mean State-Anxiety (A-State) score for each subject (Appendix I). Because a multitude of environmental and emotional factors can influence subject response(s) to the questionnaire, this method of repeated measurements provided a reliable representation of the A-State characteristic (Howard and Diesenhaus, 1965; Spielberger et al, 1970). Scores were ranked and then a procedure commonly referred to as "proportional stratified sampling" was employed to assign subjects to treatments (Ferguson, 1970: 132). Each subject was provided with an identifying number and then randomly assigned to one of the treatment groups: A.C.T., EMG biofeedback and A.C.T., or Control. Each treatment group comprised of nine subjects, five low-anxious and four high-anxious.

One week prior to the commencement of the training program the frontal region was monitored and EMG activity recorded every five minutes for twenty minutes. All subjects participated and were not provided with any knowledge of the results throughout the session. Six weeks of relaxation training succeeded the pre-test measurements for the two experimental groups while the control group was monitored on EMG activity only. The first meeting served as an introductory session in which each subject was familiarized with equipment and the procedures (Appendix D) that were employed, as well as providing an opportunity for subjects to ask questions regarding the study. A post-test session which mirrored the pre-test procedures was administered for the three treatment groups. Each subject was asked to complete a post-test questionnaire (Appendix F) regarding their participation in the study. They were permitted to take the questionnaire home following their post-test session and required to return it completed within three days.

All training and testing sessions were conducted at the University of Alberta. The laboratory was located on the fifth floor, Faculty of Education - north wing, Department of Educational Psychology.

Procedures for each treatment group are described below:

Group I: Attention Control Training (A.C.T.)

Each subject participated in eighteen, twenty minute sessions which were conducted three times each week for six weeks. To ensure that training procedures were not rushed, a one-half hour time block was reserved for each training session.

Subjects were seated facing a table that supported an electromyograph, a desk lamp, and a portable cassette player. The first two sessions of each week involved individual practice of the relaxation training procedure delivered via a pre-recorded cassette tape (Appendix C). Subjects were instructed to begin the tape when they felt ready by depressing the 'play' button. While listening to the tape, subjects were asked to follow the instructions and practice the relaxation technique of "centering" (Nideffer, 1978). At the end of the session subjects rewound the tape to the beginning and were then free to leave.

An experimenter was present in the third session of each week. This person was responsible for attaching electrodes to the subject's frontal region, recording the EMG activity, and removing the electrodes when the session was completed. During the training session, the experimenter was positioned one foot to the left and behind the subject. Following each third session, subjects signed up for the next week.

Group II: EMG biofeedback and A.C.T.

The duration of training sessions were identical to those of Group I. In addition to listening to the pre-recorded relaxation procedures, subjects utilized immediate feedback of EMG activity provided by visual displays (meter and lights).

Subjects were individually introduced to the functions of the myograph and how the feedback provided could aid them in controlling their muscle tension levels: a rise in meter scores indicated an increase in muscle activity while a decrease in scores signified that the muscles were relaxing. The lights also provided useful information as to increases and decreases of EMG activity.

Group III: Control

The control group met with the experimenter for thirty minutes, once a week for eight weeks, with each session approximately at the same hour and day of each week. To avoid procedural ambiguity, each subject was informed that the purpose of the study was to measure EMG activity in a relaxed, seated position and that the results obtained would be compared to EMG activity measured during a physically active state. Subjects were instructed to "relax and sit comfortably with their backs against the chair and feet flat on the floor" throughout the twenty minute measurement sessions.

Collection of the Data

The method of gathering the data was identical for the three groups. All training or measurement periods for the respective experimental and control groups were of twenty-minute durations (Coursey, 1976; Haynes, Moseley, and McGowan, 1976) blocked every five minutes (Appendix E). Following the completion of each five minute block, five independent readings were recorded every six seconds for thirty seconds, averaged, and a mean EMG score established (Bijou, 1968). In total, each subject received four scores in every session. Measurements from the first five minute block served as an EMG baseline score.

Analysis of the Data

Each subject in the two experimental groups participated in eighteen relaxation training sessions during a six week period. Electromyographic measurements were obtained for all subjects in the three treatment groups. A minimum of thirty-two averaged EMG scores (four session scores x eight weeks) were established for each subject with pre- and post-test scores represented by data collected in the first and eigth weeks. To parallel session comparisons between groups, only the last four scores of each week were used for Group II.

A four-factor analysis of variance (Group[3] x Anxiety[2] x Period[8] x Trial[4]) with repeated measures on the last two factors was performed to test for main and/or

significant interaction effects. For this study, the criterion for the level of significance was accepted at $p<.05$.

Newman-Keuls multiple-comparison test set at $p<.01$ was performed to further test the significant differences between means on EMG scores.

The Computing Services Department at the University of Alberta provided the MTS computer program that performed statistical computations with Version H of the Statistical Package for the Social Sciences (SPSS).

Limitations

1. The relaxation technique(s) employed in the present study may have proven ineffective for some of the subjects.
2. Subject naivety to electromyographic equipment may have caused unreliable and invalid results.
3. The presence of a second person in the room may have influenced the subjects ability to relax.
4. Spielberger's State Anxiety Inventory was used to determine subject's State Anxiety level.
5. The initial analysis indicated that the raw scores of three subjects, one representing each treatment group, deviated extremely from the norms of their respective groups. They were deleted from the final analysis.

Delimitations

1. Only subjects with no prior experience to relaxation technique(s) were allowed to participate in the study.
2. State-Anxiety levels were measured by Spielberger's State Anxiety Inventory.
3. To control environmental factors, training and testing were managed in the same room.
4. Electromyographic measurements were recorded from the frontal region utilizing surface electrodes.
5. Electromyographic measurements were collected and documented manually by the experimenter present in the room.
6. Both experimental groups practiced the technique of 'centering' to identical verbal instructions delivered via a pre-recorded cassette tape.
7. The ANOVAR program used to analyze the raw data accounted for unequal n's.

IV. RESULTS AND DISCUSSION

EMG biofeedback and Attention Control Training were examined to test their effectiveness as techniques for relaxation training. The statistical analysis was performed on twenty-seven male subjects who participated in the study for a total of six weeks. This chapter presents the results of analysis and discusses the data obtained. Raw score values are provided in Appendices G and H.

A. Results

The results of the analysis of variance on the EMG activity scores are summarized in Table 1. As expected, a significant treatment group by period interaction was found, F (14,147)=2.355, p=.006, indicating that the treatment conditions differentially affected the subjects over the treatment periods. As presented in Table 2, post-hoc analysis with the Newman-Keuls test of the initial period, EMG activity scores across the three treatment groups indicated no significant differences between the three treatment groups. Furthermore, as summarized in Table 3 and presented in Figure 1, Newman-Keuls tests across periods showed that the EMG/A.C.T. group dramatically decreased in EMG activity from the first to the final test periods, but that EMG activity scores remained the same from period four through eight; however, for these latter periods, EMG

TABLE 1
Summary Of Analysis Of Variance On EMG Scores

Source	Sum of Squares	Degrees of Freedom	Mean Squares	F	p
A	104.227	2	52.114	4.441	0.025
B	5.958	1	5.958	0.508	0.484
AB	0.438	2	0.219	0.019	0.982
Subjects within groups	246.410	21	11.734		
C	31.323	7	4.475	6.690	0.001
AC	22.055	14	1.575	2.355	0.006
BC	5.917	7	0.845	1.264	0.272
ABC	7.068	14	0.505	0.755	0.716
C x Subjects in groups	98.328	147	0.669		
D	0.352	3	0.117	0.650	0.586
AD	1.173	6	0.195	1.084	0.382
BD	0.127	3	0.042	0.235	0.872
ABD	1.519	6	0.253	1.403	0.227
D x Subjects in groups	11.365	63	0.180		
CD	1.276	21	0.061	0.848	0.660
ACD	2.843	42	0.068	0.944	0.574
BCD	1.864	21	0.089	1.238	0.214
ABCD	3.313	42	0.079	1.100	0.314
CD x Subjects in groups	31.618	441	0.072		

TABLE 2

Newman-Keuls Post Hoc Comparisons Of Mean EMG Activity Scores

For The Three Treatment Groups At The Initial Treatment Period

Groups

	Control	A.C.T.	EMG/A.C.T.		
	1.875	1.720	1.583	r	
1.875	-	0.160	0.290	3	0.317
1.720		-	0.140	2	0.265
1.583			-		

* Significantly different at the 0.05 level

TABLE 3

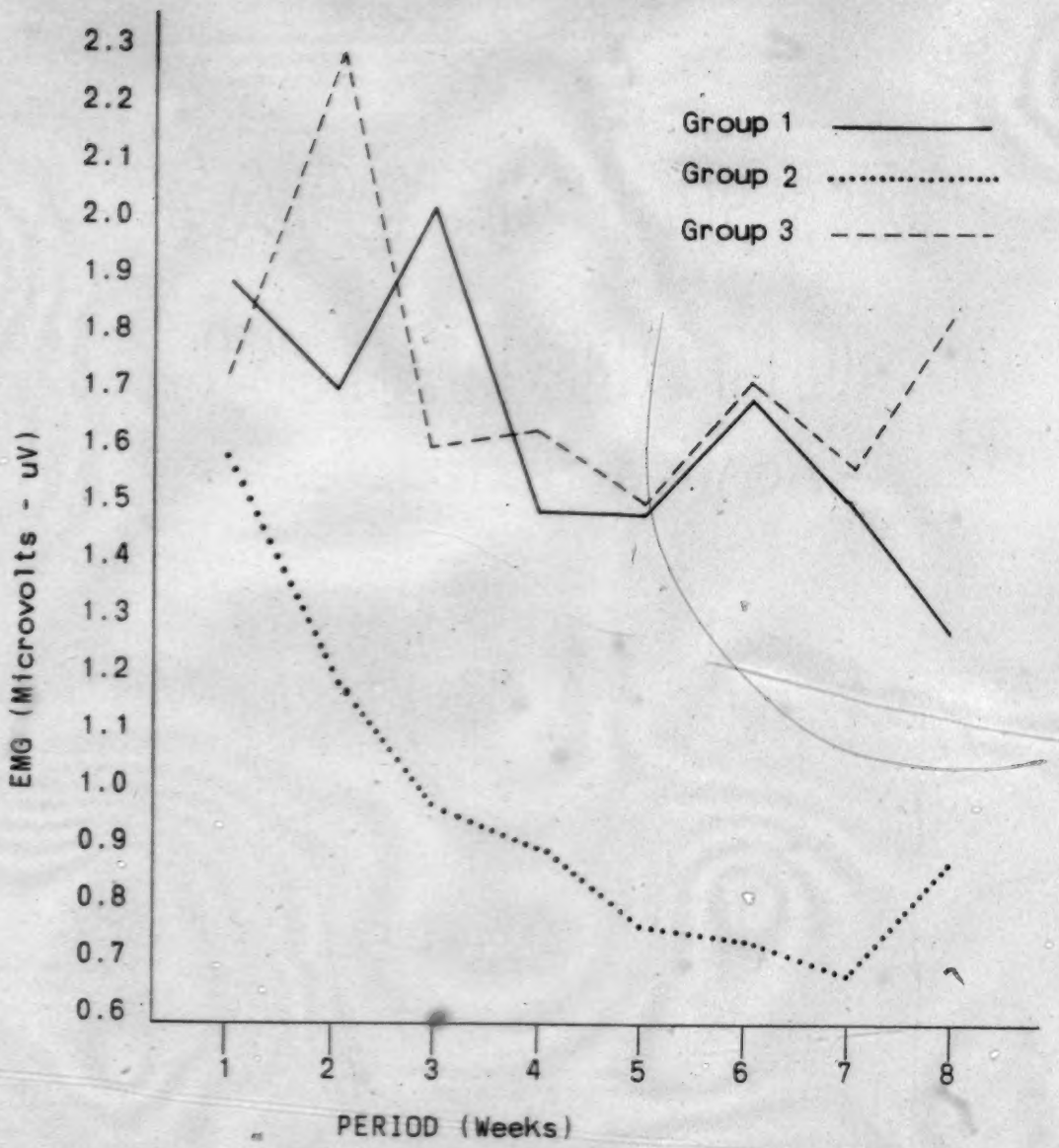
Newman-Keuls Post Hoc Comparisons of Mean EMG Activity Scores

For EMG/A.C.T. Group Across Periods

	Period									
	1	2	3	4	5	6	8	7		
	1.583	1.183	0.959	0.901	0.759	0.749	0.696	0.679	r	
1.583	-	0.400*	0.634*	0.682*	0.824*	0.834*	0.887*	0.904*	8	0.479
1.183		-	0.224	0.282	0.424*	0.434	0.487*	0.504*	7	0.468
0.959			-	0.058	0.200	0.210	0.263	0.280	6	0.457
0.901				-	0.142	0.152	0.205	0.222	5	0.442
0.759					-	0.010	0.063	0.080	4	0.422
0.749						-	0.053	0.070	3	0.396
0.696							-	0.017	2	0.349
0.679								-		

* Significantly different at the 0.01 level

FIGURE 1
Mean EMG Scores For The
Treatment Groups Across Periods



activity scores were all significantly lower than the initial pre-test, second, and third period scores. This pattern reflects a clear treatment effect that was probably limited over time due to floor effects. Table 4 presents the Newman-Keuls results for the control group and as illustrated in Figure 1 there were no significant decreases in EMG activity scores from the initial period through to the last measurement period. As noted in Table 5, the results of the Newman-Keuls test on the A.C.T. group showed that only the period eight EMG activity mean score was significantly less than the initial period score. Summarized in Table 6, the post-hoc comparisons indicated that generally, there was no difference in mean EMG activity scores at each period between the A.C.T. and control groups; however, the EMG/A.C.T. treatment group showed EMG activity scores that were significantly less than the other two treatment groups at all seven of the treatment periods.

Therefore, the above statistical analysis provides considerable support for the efficacy of the EMG/A.C.T. treatment with these male adult subjects as the mean EMG activity scores for these subjects clearly decreased due to the treatment, in contrast to the Control group and the A.C.T. group.

As reported in Tables 7 and 8, the analysis of variance resulted in a significant effect for the treatment groups, F $(2,21)=4.441$, $p=.025$, and periods, F $(7,147)=6.690$, $p=.001$. However, the above significant treatment group by period

TABLE 4

Newman-Keuls Post Hoc Comparisons

Of Mean EMG Activity Scores For Control Group Across Periods

	Period									
	2	8	1	6	4	3	7	5		
	2.277	1.872	1.720	1.712	1.617	1.581	1.561	1.497	r	
2.277	-	0.405*	0.557*	0.565*	0.660*	0.696*	0.716*	0.780*	8	0.479
1.872		-	0.152	0.160	0.225	0.291	0.311	0.375	7	0.468
1.720			-	0.008	0.103	0.139	0.159	0.223	6	0.457
1.712				-	0.095	0.131	0.151	0.215	5	0.442
1.617					-	0.036	0.056	0.120	4	0.442
1.581						-	0.020	0.084	3	0.396
1.561							-	0.064	2	0.349
1.497								-		

* Significantly different at the 0.01 level

TABLE 5

Newman-Keuls Post Hoc Comparisons Of Mean EMG Activity Scores

For the A.C.T. Group Across Periods

	Period									
	3	1	2	6	7	4	5	8		
	1.958	1.875	1.680	1.677	1.483	1.477	1.475	1.245	r	
1.958	-	0.083	0.278	0.281	0.475*	0.481*	0.483	0.713	8	0.479
1.875		-	0.195	0.198	0.392	0.398	0.400	0.630*	7	0.468
1.680			-	0.003	0.197	0.203	0.205	0.435	6	0.457
1.677				-	0.194	0.200	0.202	0.432	5	0.442
1.483					-	0.006	0.008	0.238	4	0.422
1.477						-	0.002	0.232	3	0.396
1.475							-	0.230	2	0.344
1.245								-		

* Significantly different at the 0.01 level

TABLE 6

Post Hoc Comparison Of EMG Mean Score Differences

Between Treatment Groups Across Periods

Period

Group Comparisons	1	2	3	4	5	6	7	8
1 from 2	2.13*	3.63*	7.29*	4.20*	5.23*	6.77*	5.87*	3.99*
1 from 3	1.13	4.36*	2.75*	1.02	0.16	0.26	0.55	4.58*
2 from 3	1.00	7.99*	4.54*	5.23*	5.39*	7.03*	6.44*	8.57*

A mean difference of 1.66 was required for significance at the 0.05 level.

* Significant at the 0.05 level

TABLE 7

Newman-Keuls Post Hoc Comparisons Of Mean EMG Activity Scores

For The Three Treatment Groups

Groups

	Control	A.C.T.	EMG/A.C.T.		
	1.730	1.609	0.939	r	
1.730	-	0.121	0.791*	3	0.417
1.609		-	0.670*	2	0.344
0.939			-		

* Significantly different at the 0.05 level

TABLE 8

Newman-Keuls Post Hoc Comparisons Of EMG Activity Scores

For The Three Treatment Groups Across Periods

	Period									
	1	2	3	6	4	8	5	7		
	1.726	1.713	1.499	1.379	1.332	1.271	1.244	1.241	r	
1.726	-	0.013	0.227*	0.347*	0.394*	0.455*	0.482*	0.485*	8	0.279
1.713		-	0.214*	0.334*	0.381	0.442*	0.469*	0.472*	7	0.273
1.499			-	0.120	0.167	0.228	0.255	0.258	6	0.267
1.379				-	0.047	0.108	0.135	0.138	5	0.258
1.332					-	0.061	0.088	0.091	4	0.246
1.271						-	0.027	0.030	3	0.231
1.244							-	0.003	2	0.204
1.241								-		

* Significantly different at the 0.01 level

interaction must qualify the interpretation of these results.

B. Discussion

The results of the analysis of variance supports the first hypothesis that both EMG biofeedback and Attention Control Training as a combined relaxation technique would prove most successful in the reduction of EMG activity in comparison to practicing only Attention Control Training or no relaxation training at all. As compared to the other two treatment groups, the EMG/A.C.T. group significantly decreased in EMG activity throughout the initial training periods and this decrease continued in a gradual ordinal direction for the remainder of the training periods. The analysis indicated that the Control group and A.C.T. group remained comparatively the same from the pre- to post-test periods. The success of the EMG/A.C.T. group may have resulted as a function of EMG feedback received during each training session. The immediate fedback information could have possibly served as a reinforcement of their success when lower levels of EMG activity was experienced (Brown, 1977). This may have further facilitated relaxation training (Grim, 1971; Budzynski, 1977). Examination of the data also indicates that subjects receiving EMG feedback training significantly decreased EMG activity in comparison to those subjects receiving no EMG feedback training. These results support the third hypothesis and qualify the findings of the

first hypothesis previously reported.

The subjects in the EMG/A.C.T. treatment group indicated in a post-experimental questionnaire that EMG biofeedback and the pre-recorded relaxation instructions provided assistance and direction, respectively, to their relaxation training. Assistance refers to the immediate feedback that was provided by their EMG activity while direction refers to their refocusing of attention from distracting thoughts. It should be noted that subjects in this group reported experiencing some difficulty in their attempts to focus on a body part directly behind the navel (Nideffer, 1976, 1978). This was also reported by subjects practicing Attention Control Training independently. As a result, this may explain why no significant decreases in EMG activity occurred for this treatment group.

Hypothesis two proposed that EMG activity of the A.C.T. group would be significantly lower than the Control group's due to treatment. The analysis does not support this proposition. The Attention Control Training technique may have been ineffective for this group. A possible cause of the results obtained may simply be a fault in the procedures themselves: subjects must rely on their subjective feelings to minute discriminations of physiological changes, whereas, if biofeedback training was utilized, an awareness of these physiological changes would have been provided (Budzynski and Stoyva, 1969; Coursey, 1975; Brown, 1977). The analysis did not show a significant difference in EMG activity

between the low and high state-anxiety subjects and therefore does not support hypothesis four. As a possible explanation, the subject sample may have been relatively homogeneous and not characteristic of low and high anxiety states as intended.

V. SUMMARY AND CONCLUSIONS

A. Summary

The purpose of this study was to examine the effectiveness of EMG biofeedback and Attention Control Training as instrumental techniques for relaxation training. Four directional hypotheses were presented and tested in this study:

1. Subjects receiving treatment in the form of both EMG biofeedback and Attention Control Training will exhibit a significant decrease in EMG activity in comparison to those subjects practicing only Attention Control Training or no relaxation training at all.
2. Subjects receiving Attention Control Training will exhibit a significant decrease in EMG activity in comparison to those subjects receiving no Attention Control Training.
3. Subjects receiving EMG feedback will exhibit a significant decrease in EMG activity in comparison to those subjects receiving no EMG feedback.
4. High state-anxiety subjects will exhibit a greater decrease in EMG activity as a function of training in comparison to low state-anxiety subjects

Twenty-seven subjects volunteered to participate in the study and were full-time students at the University of

Alberta. Each subject was screened to determine if they had any exposure to relaxation techniques prior to the commencement of the study, if not, the subjects completed Spielberger's State-Anxiety Inventory and were then randomly assigned to one of three treatment groups: Attention Control Training, EMG biofeedback and Attention Control Training, or Control.

A four-factor analysis of variance with repeated measures on the last two factors, was performed on mean EMG activity scores for each person and group. The significance level was set at $p<.05$. Newman-Keuls multiple comparison tests, set at $p<.05$, and post-hoc comparison test set at $p<.01$, were used to examine the differences of the mean EMG activity scores.

The analysis indicated a significant group by period interaction effect and significant main effects for the treatment groups and periods. No significant difference in EMG activity scores was observed between low and high anxiety subjects or the Control group in comparison to the Attention Control Training group.

B. Conclusions

As a result of the data analysis, the following conclusions were drawn:

1. EMG activity levels of subjects practicing both EMG biofeedback and Attention Control Training were significantly decreased in comparison to subjects

practicing only Attention Control Training or no relaxation training at all. This suggests that relaxation training is best facilitated when practicing EMG biofeedback and Attention Control Training simultaneously.

2. Subjects receiving EMG feedback demonstrated a significant decrease in EMG activity from pre- to post-test periods in comparison to subjects receiving no EMG feedback. It seems that an awareness of EMG activity aids in the reduction of muscle tension levels in the frontal region.
3. There were no significant differences demonstrated between the Control and A.C.T. groups as a result of treatment.
4. There were no significant differences demonstrated between low and high anxiety subjects.

C. Recommendations

The treatment procedures indicated that subjects who were provided EMG feedback and practiced Attention Control Training simultaneously demonstrated significant decreases in EMG activity irrespective of their initial low or high state anxiety status. To assist in further investigations regarding these factors, the following recommendations are suggested:

1. Trait anxiety scores might be used to determine low and high anxiety subjects.

2. Training sessions should be practiced independently with only the subject present in the room to eliminate any possible distractions that might be caused by the presence of the experimenter.
3. The subjects practicing relaxation training should be presented with simulated stressors as a test of their ability to control anxiety levels.
4. A group practicing only EMG feedback training should be included as another treatment group for comparison purposes to other treatment groups.
5. A field investigation incorporating the relaxation techniques used in this study should be conducted as a test of their applicability to real-life situations.

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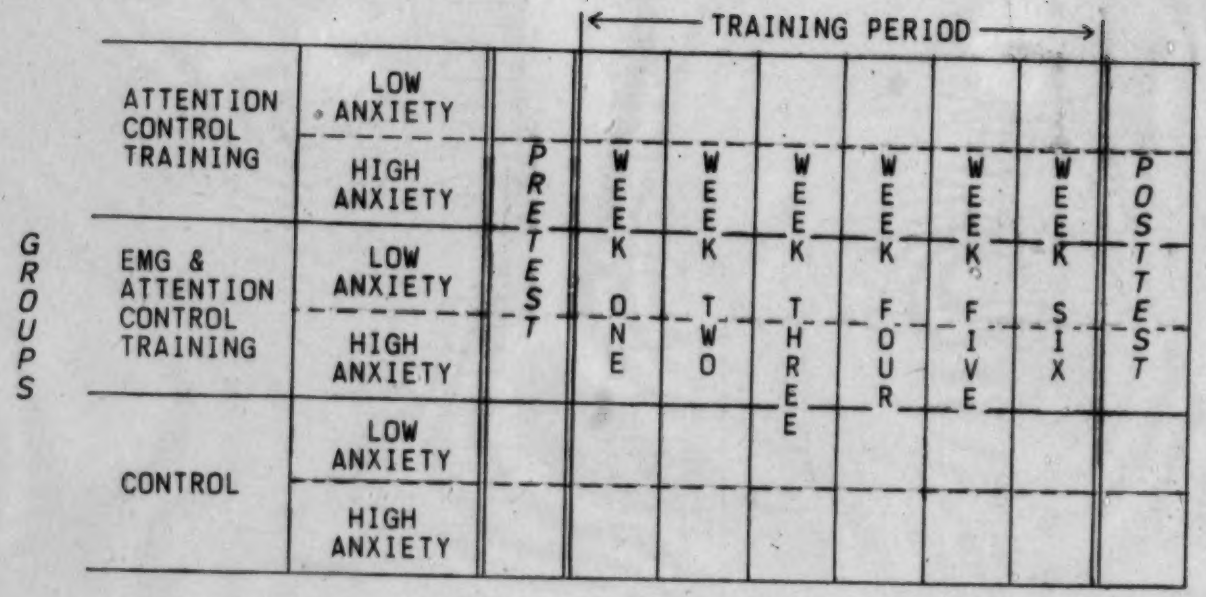
APPENDICES

A: Experimental Design

FIGURE 2
Experimental Design



B: Spielbergers State Anxiety Inventory

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Date Aug 6, 1982

SELF-EVALUATION QUESTIONNAIRE
HOW DO YOU FEEL RIGHT NOW?

Name:_____

Circle the number (using the key) which seems to best describe your feelings - YOUR FEELINGS AT THIS VERY MOMENT

1 = Not At All
2 = Somewhat
3 = Moderately So
4 = Very Much So

1.	I feel calm	1 2 3 4
2.	I feel secure	1 2 3 4
3.	I am tense	1 2 3 4
4.	I am regretful	1 2 3 4
5.	I feel at ease	1 2 3 4
6.	I feel upset	1 2 3 4
7.	I am presently worrying over possible misfortunes	1 2 3 4
8.	I feel rested	1 2 3 4
9.	I feel anxious	1 2 3 4
10.	I feel comfortable	1 2 3 4
11.	I feel self-confident	1 2 3 4
12.	I feel nervous	1 2 3 4
13.	I am jittery	1 2 3 4
14.	I feel "high strung"	1 2 3 4
15.	I am relaxed	1 2 3 4
16.	I feel content	1 2 3 4
17.	I am worried	1 2 3 4
18.	I feel over-excited and rattled	1 2 3 4
19.	I feel joyful	1 2 3 4
20.	I feel pleasant	1 2 3 4

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C: Instructions For Attention Control Training

Attention Control Training

(Taped Instructions)

(In a seated position)

Begin by sitting in a comfortable, upright position with the back against the chair and your weight evenly distributed on the seat. Let your arms hang by the sides of your body while the hands are resting on your lap. Do not rest the elbows on the chair. As your arms relax, they should feel loose and heavy, as though gravity is pulling them downward to the floor. Breathing is slow and smooth. To reduce any tension that may be in your jaw muscles, open your mouth slightly. Notice the passage of air as you inhale and exhale. Your jaw muscles should begin to feel loose and heavy. Breath from deep down in your abdomen, letting the muscles in your stomach expand rather than in your chest - you will find this method to be more comfortable and easy.

Check to see if the forehead region is tense - if so, relax this area and rid yourself of the tension. Your eye lids should feel loose and relaxed, but do not let them close completely as you relax. Avoid distracting yourself by looking all around. You may want to focus on an area in front of you . . . either the wall, the table, or a piece of equipment. Try not to stare at any one thing - keep the eyes moist and focus on something that is comfortable.

Notice the feeling of heaviness in your body. Relax the muscles in your arms and shoulders. Let the shoulders drop and feel limp. Now see if you can drop your shoulders even more. Because tension is common in this area, attempt to totally relax your muscles and let the shoulders hang loose. It should feel as though your upper body is being pulled downward.

Inhale slowly . . . and deeply through your mouth. As you do, notice how your body feels comfortable and relaxed.

Breathing is slow and smooth while the stomach muscles move in and out. Avoid any increase of tension in the neck and shoulder muscles . . . You are able to inhale and yet not have tension levels rise.

Your feet should be flat on the floor. If necessary, adjust your legs to reduce any excessive muscle tension. The leg muscles should feel loose and relaxed while the feet feel very heavy. The body should feel totally at ease. Again, notice the pleasant feeling as you become even more anchored in the chair . . . more relaxed. The muscles in both arms, both legs, and in your shoulders are completely relaxed.

In the martial arts, the mind is cleared of distracting thoughts by focusing attention on one thing. This thing, or spot, is a place just behind the navel. Try now to imagine a spot in this area . . . Let your mind relax as

you begin to imagine this spot. Your breathing is slow and smooth. You are becoming more and more relaxed. Continue breathing comfortably As you are letting yourself relax, your thoughts should be focusing on the one spot. This technique is called centering your attention on one thing, thereby, letting your mind relax from distracting thoughts.

Check to see that all parts of your body are loose and relaxed . . . your eyes open . . . neck and shoulder muscles loose . . . your feet flat on the floor . . . and arms comfortably relaxed at you side.

For the next few minutes, practice the technique of "centering" - integrating your mind and thoughts into a comfortable and relaxed state as you begin to center your attention on the one spot. Breathing is from the stomach . . . slow and smooth . . . (let the tape run)

You should now feel more relaxed, more at ease. Your breathing is slow, and thoughts are clear.

Utilizing the stategies presented in the tape, challenge your ability to center your attention. Focus your thoughts on a spot just behind your navel. Again, your breathing is from the stomach, slow and smooth . . . check to see that the muscles in your body are completely relaxed. The tape will indicate when the session is completed . . . Begin now to "center" your attention . . . (let the tape run)

That's fine . . . your mind should feel clear and your body should feel relaxed. (End of tape procedures)

D: Introductory Information Sheets

INTRODUCTORY INFORMATION SHEET 1
(A.C.T. Treatment Group)

Before you begin the training session, I take this opportunity to sincerely "thank-you" for volunteering to participate in my Masters' thesis dissertation. It is difficult to locate subjects who are willing to take time and interest to be part of scientific research.

In addition to helping me through your active involvement, you will gain some insight into the area of Stress Management and learn one strategy which can be useful in coping with our competitive society be it family matters, personal relationships, sports, business affairs, academics, or whatever. Training programs such as the one you have been introduced to cost consumers anywhere between $25.00 to $75.00 a session.

Several groups exist within the study. The group you have been randomly assigned to utilizes a relaxation technique designed to help focus one's attention on important or relevant cues and disregard those disturbing cues that can be detrimental to physical and mental performance.

For example: A quarterback who cues in on how nervous he feels because of the T.V. cameras, the sell-out home crowd, his family and friends in the stands, as well as the coach yelling at him must obviously play below his ability than if he just calmed himself down and cued in on the opposing defensive team.

You should follow the suggestions of the taped procedure. Upon completion of the training sessions, you will be amazed at the ability you possess to relax yourself in stressful situations. Every third session involves an Electromyographic (EMG) measurement. This technique is simply measuring muscular electrical activity which has been found to be directly related to a person's experience of stress. So during these sessions, you should utilize the taped procedure to help you relax as much as possible.

The important thing to remember is that "witch-craft" has no bearing on your accomplishments. You are the one responsible for the results that occur -- it may take many training sessions, but give yourself time, be patient and want the procedure to work for you.

As mentioned earlier, before the study commenced, please refrain from actively participating with other relaxation techniques.

INTRODUCTORY INFORMATION SHEET 2
(EMG/A.C.T. Treatment Group)

Before you begin the training session, I take this opportunity to sincerely "thank-you" for volunteering to participate in my Masters' thesis dissertation. It is difficult to locate subjects who are willing to take time and interest to be part of scientific research.

In addition to helping me through your active involvement, you will gain some insight into the area of Stress Management and learn one strategy which can be useful in coping with our competitive society be it family matters, personal relationships, sports, business affairs, academics, or whatever. Training programs such as the one you have been introduced to cost consumers anywhere between $25.00 to $75.00 a session.

Several groups exist within the study. The group you have been randomly assigned to utilizes Electromyography (EMG) feedback and a recorded relaxation procedure. EMG feedback is simply a method used to measure levels of muscular electrical activity which has been found to be directly related to a person's experience of stress. In front of you, a meter exists on the equipment. As the needle goes up, there is an increase in muscle activity and as the needle goes down, you are becoming more relaxed. You should utilize feedback indicated on the meter as well as the taped procedures to help you relax as much as possible.

The relaxation procedure is designed to help focus one's attention on important or relevant cues and disregard those disturbing cues that can be detrimental to physical and mental performance.

For example: A quarterback who cues in on how nervous he feels because of the T.V. cameras, the sell-out home crowd, his family and friends in the stands, as well as the coach yelling at him must obviously play below his ability than if he just calmed himself down and cued in on the opposing defensive team.

You should follow the suggestions of the taped procedure. Upon completion of the training sessions, you will be amazed at the ability you possess to relax yourself in stressful situations.

The important thing to remember is that "witch-craft" has no bearing on your accomplishments. You are the one responsible for the results that occur -- it may take many training sessions, but give yourself time, be patient and want the procedure to work for you.

As mentioned earlier, before the study commenced, please refrain from actively participating with other relaxation techniques.

INTRODUCTORY INFORMATION SHEET 3
(Control Group)

Before you begin the training session, I take this opportunity to sincerely "thank-you" for volunteering to participate in my Masters' thesis dissertation. It is difficult to locate subjects who are willing to take time and interest to be part of scientific research.

The purpose of this study is to measure the muscle tension or electrical activity from your forehead region. In each session, you are asked to sit comfortably and relax. The results obtained will then be compared to electrical activity of subjects during a physically active state.

The equipment you see before you is called a "myograph" which measures electrical muscle potential. For measurement purposes, three electrodes will be placed on your forehead. You will not be allowed to see any of the results until the study has been completed, at which time you will be informed of your scores and results.

As a participant, you will be involved in a total of eight measurement sessions, meeting once a week for eight weeks. Each session will last approximately twenty minutes.

If you should have any questions regarding the study, please feel free to ask.

E: Scoring Sheet

Name:_____ Age:_____ Faculty:_____

Group:_____ STAI: (1)__ (2)__ ($\bar{x}$)__ Scale:_____

WEEK		0	5 min	$\bar{x}$	10 min	$\bar{x}$	15 min	$\bar{x}$	20 min	$\bar{x}$
PRETEST										
1.	Feb.									
	Feb.									
	Feb.									
2.	March									
	March									
	March									
3.	March									
	March									
	March									
4.	March									
	March									
	March									
5.	March									
	March									
	March									
6.	March									
	March									
POST-TEST										

F: Post-Experimental Questionnaires

POST EXPERIMENTAL QUESTIONNAIRE 1
(A.C.T. and EMG/A.C.T. Treatment Groups)

Could you please take a few minutes to answer some questions regarding your participation in the study. Your answers will help me in the analysis of the data so your cooperation and honesty will be greatly appreciated.

1. Do you feel you learned anything from the study? Could you briefly elaborate upon your answer.

2. What did you feel like going through the sessions? (i.e., a feeling of lightness, really relaxed, etc.)

3. Was there anything that could have affected your ability to "train"? (i.e., time of day, experimenter present, bored, etc.)

4. Do you feel that six weeks was enough time for your practicing of the relaxation technique? (More or less training sessions?)

5. Were you able to "Center" your attention on the one spot behind your navel?

6. Any additional comments regarding the study?

POST EXPERIMENTAL QUESTIONNAIRE 2
(Control Group)

Could you please take a few minutes to answer some questions regarding your participation in the study. Your answers will help me in the analysis of the data so your cooperation and honesty will be greatly appreciated.

1. What did you feel like as you participated in the sessions? (i.e., relaxed, bored, etc.)

2. When you were asked to "sit comfortably and relax" what, if any, strategies did you try to use to relax?

3. Was there anything that could have affected your ability to relax?

4. Any additional comments regarding the study?

G: Raw Score Values On Pre- And Post-Test EMG Activity

TABLE 9

Raw Score Values On Pre-Test
EMG Activity For Treatment Groups

Group	Subj.	Trial 1	Trial 2	Trial 3	Trial 4
A.C.T.	1	1.365	1.305	1.080	1.077
	2	1.875	1.980	1.770	1.680
	3	2.130	1.740	1.395	1.383
	4	2.750	3.100	2.200	2.350
	5	1.275	2.250	2.280	2.295
	6	1.425	1.440	1.530	1.290
	7	1.815	1.740	1.533	1.545
	8	2.400	2.750	3.550	3.790
	9	1.470	1.320	1.380	1.260
EMG/ A.C.T.	1	1.350	1.680	1.065	1.005
	2	1.170	1.260	1.260	1.320
	3	1.590	1.512	1.755	1.680
	4	0.951	0.990	0.990	0.975
	5	1.245	1.290	1.395	1.272
	6	2.460	2.670	2.130	2.133
	7	1.260	1.575	1.530	1.476
	8	1.050	1.365	1.560	1.509
	9	3.750	2.650	2.000	2.110
Control	1	1.605	1.140	1.200	1.185
	2	2.100	1.305	1.140	1.101
	3	3.300	4.110	4.350	4.260
	4	0.948	1.360	1.280	1.170
	5	0.867	0.876	0.900	0.987
	6	2.010	1.980	2.070	1.890
	7	1.620	1.755	1.515	1.536
	8	0.915	0.969	1.344	1.377
	9	2.514	1.524	1.902	1.806

TABLE 10

Raw Score Values On Post-Test
EMG Activity For Treatment Groups

Group	Subj.	Trial 1	Trial 2	Trial 3	Trial 4
A.C.T.	1	0.822	0.951	0.921	1.044
	2	1.131	1.140	1.269	1.356
	3	0.957	0.975	0.963	1.233
	4	1.302	1.470	1.626	1.701
	5	1.122	1.970	1.780	1.850
	6	0.906	0.972	0.975	0.681
	7	0.888	1.038	0.957	0.969
	8	1.970	2.150	2.290	2.390
	9	0.744	0.756	0.765	0.807
EMG/ A.C.T.	1	0.639	0.780	0.792	0.768
	2	0.510	0.477	0.615	0.579
	3	0.639	0.711	0.708	0.771
	4	0.600	0.495	0.495	0.495
	5	0.768	0.738	0.750	0.744
	6	0.714	0.759	0.834	0.885
	7	0.789	0.825	0.828	0.714
	8	0.639	0.735	0.693	0.699
	9	0.738	0.717	0.735	0.675
Control	1	1.065	1.113	1.200	1.191
	2	1.374	1.617	1.632	1.773
	3	3.130	3.360	3.260	3.400
	4	1.460	1.610	1.520	1.490
	5	0.585	0.609	0.609	0.597
	6	1.830	2.000	1.700	1.970
	7	1.587	1.458	1.455	1.323
	8	1.032	0.990	1.143	1.188
	9	0.402	3.600	4.650	4.840

H: Raw Mean EMG Score Values Across Trials

TABLE 11

Raw Mean EMG Score Values Across Trials For Treatment Groups

Group	Period	Trial 1	Trial 2	Trial 3	Trial 4
A.C.T.	1	1.834	1.958	1.858	1.852
	2	1.797	1.556	1.617	1.752
	3	1.823	1.983	1.960	2.065
	4	1.463	1.358	1.569	1.519
	5	1.469	1.451	1.460	1.519
	6	1.604	1.675	1.748	1.680
	7	1.531	1.534	1.499	1.368
	8	1.094	1.269	1.283	1.336
Mean		1.577	1.598	1.624	1.636
EMG/ A.C.T.	1	1.647	1.666	1.521	1.498
	2	1.337	1.171	1.107	1.119
	3	0.977	0.968	0.949	0.940
	4	0.973	0.879	0.871	0.879
	5	0.799	0.758	0.730	0.749
	6	0.753	0.759	0.741	0.744
	7	0.710	0.650	0.665	0.691
	8	0.671	0.693	0.717	0.703
Mean		0.983	0.943	0.913	0.915
Control	1	1.764	1.669	1.745	1.701
	2	1.985	2.142	2.512	2.468
	3	1.636	1.628	1.574	1.484
	4	1.496	1.592	1.647	1.734
	5	1.464	1.546	1.411	1.569
	6	1.611	1.454	1.859	1.923
	7	1.525	1.491	1.634	1.594
	8	1.787	1.817	1.908	1.975
Mean		1.658	1.667	1.786	1.806

I: Raw Mean Score Values For A-State Inventory

TABLE 12

Raw Mean State-Anxiety Scores For Three Treatment Groups

	A.C.T.	EMG/A.C.T.	CONTROL
LOW ANXIETY	24.5	27.0	22.5
	29.5	27.5	24.5
	34.5	29.5	28.0
	35.0	32.5	29.5
	35.0	33.0	31.5
Mean	31.7	29.9	27.2
HIGH ANXIETY	39.0	36.5	37.5
	46.0	44.0	38.0
	49.0	45.0	43.5
	60.0	50.0	45.0
Mean	48.5	43.9	41.0